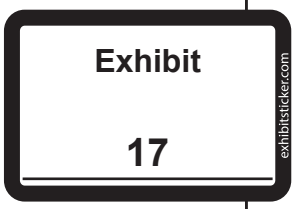
IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF OKLAHOMA



LAZY S. RANCH PROPERTIES, LLC, an Oklahoma limited liability company,	)	
Plaintiff,	)	
-vs-	)	CASE NO. 19-cv-425-JWB
VALERO TERMINALING AND DISTRIBUTION COMPANY; VALERO PARTNERS OPERATING CO., LLC; and VALERO PARTNERS WYNNEWOOD, LLC,	)	
Defendants.	)	

DEPOSITION OF

KENNETH F. EDE, Ph.D., CHMM

TAKEN ON BEHALF OF THE DEFENDANTS

TULSA, OKLAHOMA

ON AUGUST 26, 2022

REPORTED BY: TRENA K. BLOYE, CSR

originates, fingerprint is more of the process of where the peaks are determine its fingerprint.
Q Okay. So --
A And the above graph there you can see between C2 and C30, it's where those peaks are, the intensity of the peaks and where they are located.
Q Okay. So this is probably a good time. Let's just look at your next page and let me see if I can summarize what you just said, or understand what you just said. So when you say when you think of fingerprinting and where the hydrocarbon residue originated, you're looking at these peaks like we see here in the middle of the page?
A Right.
Q And you're saying that that helps tell you what type of hydrocarbon residue you're looking at?
A Exactly. Not just one peak. It is all the peaks. It is their intensity. And on the X axis, that is time on the X axis. So when you inject on the left-hand portion, that's two minutes, and to the right it looks like 38 minutes.
So you can imagine the longer chain molecules it takes -- in the gas chromatogram, most -- chromatography, the column is about a football field. It's about a hundred yards. So you can imagine these

molecules going through a hundred yards in a column. The small molecules come out first. The longer chain molecules come out later on. By this pattern, by the intensity and where they are located, chemists can determine what the material is.
Q So this example we see on page 13 of the gas chromatography, the peaks are in the middle, which leads you to believe or allows you to conclude it's diesel. Is that fair to say?
A Yes. Not only that, but the way the shape, the shape of all the peaks put together.
Q Okay. So this is an example of what you would characterize as fingerprinting because you can look at the gas chromatography and decide what type of carbon residue you think it is. Is that fair to say?
A Yes, sir.
Q And this -- well, and the same thing would be true. On the next page you have a gasoline, standard gas chromatography. The distinction here is that the peaks are at the far left, and so that would indicate to you that its more of a gas -- or is a gasoline residue than something like a diesel residue?
A Yes, sir.
Q So when you talk about the origination, or the hydrocarbon origination is known as fingerprinting, that

means trying to find out what type of hydrocarbon residue you're looking at?
A Yes, sir.
Q Okay. Does it in any way -- or does your analysis have anything to do with the relative age of the hydrocarbon residue?
A By the gas chromatograms, chemists not only can we tell you what the material is, but we can say how fresh it is.
Q And how does that happen?
A The way it happens is this. It's very interesting in microorganisms. When you think about a microorganism, it doesn't have a mouth. Think about it. A microorganism has no mouth, so the only way it can reproduce -- and the only way it can reproduce is to feed. So something must be water soluble, it has to be solubilized, and through osmosis it obtains the food.
So if you have a smaller chain molecule it's more -- generally more soluble than a long-chain molecule. Therefore, on biodegradation or weathering, microorganisms, the smaller chain molecules are going to be consumed first. And once they are gone, then the microorganisms will then continue to and try to eat the longer chain molecules.
And what is so interesting, if you look at old

runways from World War II that were asphalt, some of them are still in existence. And when you think about it, that's just a very long chain molecule. And people say, How could they have lasted since World War II?
And the reason why they are is because microorganisms, it's very difficult for a microorganism to consume something like asphalt.
Q Got it.
A Yeah.
Q So biodegradation can occur in aerobic settings; right?
A Both aerobic and anaerobic.
Q So it occurs as a lower pace or a slower pace in an anaerobic setting?
A Yes, sir.
Q Okay. And let's think -- I'm going to give you a hypothetical plume. Let's say you find a plume at American Airlines in the Tulsa maintenance plant. It's a big plume. The center of the plume would biodegrade at a lesser rate than the outer parts of the plume because there is less biodegradation possible. Is that fair to say?
MR. PAGE: Object to form.
A If in the middle, as you said, it's highly concentrated, and we call it LNAPL. You actually have

two phases. And if you take oil and water as a prime example on salad dressing, you can shake it up and shake it and you put it back on the table, you get two phases. It's the petroleum distillate or the oil that we're going to be eating on top.

If it is so thick, you are absolutely correct, the microorganism, it's too much for them. It's actually -- again, so what they do, as you said, in the perimeter you will get more biodegradation. And as those molecules are consumed, then the microbes will go toward the center.

Q And that could be true for a plume either in an anaerobic or setting or in an aerobic setting. Is that fair to say?

A That is correct.

Q The next sentence says, "This is accomplished through the use of gases -- sorry. I'm jumping around a little bit. "This is accomplished through the use of gas chromatography to identify specific compounds present in the environment" --

MR. PAGE: Could you identify where you are reading from, please?

MR. JOHNSON: Sorry. I jumped back to page --

THE WITNESS: Twelve.

MR. JOHNSON: -- twelve.

MR. PAGE: Thank you.

Q (By Mr. Johnson) So I'm starting after the word fingerprinting. Actually, I'm just going to start again.

You wrote, "This is accomplished through the use of gas chromatography to identify specific compounds present in the environment and the corresponding carbon content in conjunction with what is known about the source, use, and properties of these compounds."

And then that chromatography that you refer to is specifically what we're looking at on pages 13, 14, and 15; is that right?

A Yes, sir.

Q All right. Next you talk about weathering. You wrote the term, "Weathering describes physical, chemical, and biological, biochemical changes that affect hydrocarbons and alter the composition of petroleum hydrocarbon mixtures after they are released to the environment."

Okay. So sounds sort of self-explanatory. Let me try to say it back to you a little different. Wherever the hydrocarbons may be located, they can be subject to weathering due to environmental conditions. Is that fair to say?

A Yes, sir.

Q Okay. And the weathering can occur, I think we will agree on this, the weathering can occur at different rates depending on the location of the hydrocarbon residue?

A That's correct.

Q So are there different rates of weathering, say, on a, you know, on a hot highway that no one has driven on, but somebody spilled some gas, versus, you know, 50 feet underground in an aquifer?

MR. PAGE: Object to the form.

Q (By Mr. Johnson) Can there be different rates of weathering?

MR. PAGE: Same objection.

A There can be different rates of weathering.

Q (By Mr. Johnson) Okay. And are there different rates of weathering among atmospheric conditions, aquatic conditions, and then in the soil?

MR. PAGE: Object to the form.

A Yes, sir.

Q (By Mr. Johnson) Is it possible to know the different rates of weathering in all those three types of different conditions? I mean, have there been studies on that?

A In that situation there have certainly been

studies on -- and we do -- predominantly you will see it in university laboratories. They do this in test tubes, and they develop half lives and those kinds of things.

However, there's a big difference of doing an experiment with one milliliter in a test tube versus outside, and sometimes it's difficult to correlate one with the other.

Q The reason is because that the lab studies have sort of a perfect setting with the perfect micro and macronutrients that don't necessarily exist in the atmosphere or in the soil; right?

A Exactly.

Q Okay. So the lab tests are -- I'm trying to find the right word here -- they are, in some ways, an ideal setting to measure weathering as opposed to trying to do it out in nature. Is that fair?

MR. PAGE: Object to the form.

A That is correct.

Q (By Mr. Johnson) Okay.

A And most laboratories are 75 degrees Farenheit. And if you have been in Oklahoma for the last month it's rare, it's been 75 degrees.

Q That's true.

A Yeah.

Q Okay. The next page is -- well, let me read

from the bottom of 14 onto 15. "Referenced below is an exhibit from the Interstate Technology and Regulatory Council, ITRC, addressing petroleum weathering."

First of all, what is the ITRC?

A It's an agency, federal agency that does a lot of research and a lot of publications.

Q Okay. And then you include this conceptual site model. Tell me -- I know there's a lot going on here, so I apologize for my broad question. But what does this diagram or chart -- diagram, I guess, what does this show?

A It shows to a certain extent as far as here is a pipeline. And this is from the ITRC. And you have a pipeline leaking. And what it's showing is sort of the phaeton (phonetic) transport of the materials, of the petroleum distillates --

Q Okay. Right below that you went on to say, "According to NOAA there are basically seven types of weathering of petroleum distillates," and then you list all seven. NOAA is also a government agency; right?

A -- yes, sir.

Q All right. So let's go through these types of weathering. The first is adsorption, sedimentation. What is that?

A Adsorption, any time you see A-D versus A-B,

A-D means "attached onto." So that's what absorption means. One substance is attracted to and adheres to another substance without actually penetrating. So you have hydrocarbon materials absorbing, let's say, to a soil.

And from that point, once they are retarded there, then you can have microbial action. All these sort of work together. It is interesting that when you have a spill of petroleum distillate, it isn't just one thing. It's all seven generally.

Now, No. 7, photooxidation, obviously for groundwater that's not a big issue. You are not going to have No. 7, photooxidation. But on the surface water, if you have a petroleum distillate still on a lake or pond you certainly could get photooxidation.

Q Okay. I get what you're saying. But they generally work together or work in parallel or happen in parallel. Would the same be true for six? I mean, if you have a plume or contamination in soil, 50 feet underground or 10 feet underground or something, in an anaerobic setting there would be evaporation?

MR. PAGE: Object to the form.

A It would be unusual, if you have groundwater and it's 60 or 80 feet below the surface, to see much evaporation.

Q (By Mr. Page) What about in soil, though? There would not be evaporation?

MR. PAGE: Object to the form. Ambiguous, "soil."

A If the soil was near the surface you certainly could get evaporation. But if you have soil, you know, 100 feet below the ground, no.

Q (By Mr. Johnson) Okay.

A Very, very little.

Q I'm on No. 5 now. What's emulsification?

A Sometimes -- here is a prime example. You can actually -- emulsification. We also have a co-solvent if you have more than one pollutant. And many times in industry they will use halogenated solvents for degreasing, and they also are in groundwater, and they have petroleum distillates also in the groundwater.

Q Okay. Number 3 is Distribution. It says, "The distribution of spilled oil into the upper layers of the water column by natural wave action or application of chemical disbursements." So let's do -- that's two things. Natural wave action is the water moving on its own; right?

A Right.

Q And it causes oil to rise to the upper layer?

A Right, and disburse.

Q A little bit like the salad dressing, but that's different?

A But in the ocean when you have a lot of waves, you'll notice it starts in one place, and the, let's say an oil spill, and it eventually will disburse.

Q Okay. And then would that be true for, let's say, in an underwater groundwater setting as well potentially, that it could disburse?

A Oh, absolutely, absolutely.

Q All right. Application of chemical dispersants, tell me what that is.

A There are many they use on surface water that purposely do this, disburse the spill. You have a large oil spill, let say in the bay or the ocean, you want it as thin as possible there for microbial action. You get better microbial action the thinner the film.

Q And microbial action acts to eliminate the hydrocarbon --

A Consume it, actually consume it, use it for food.

Q All right. Biodegradation is No. 2.

A Yeah.

Q I mean, I think that's sort of what you're saying.

A Right. Again, these all work together.

the maximum six months old, maybe three months, maybe even earlier. So this petroleum distillate is not from the 80s.

Q So is it your estimate that the petroleum distillate is no older than six months?

A No older than six months, that's correct.

Q And what is the basis for that?

A The peaks. I think I have the --

Q Are you talking about on 13 and 14 or are you talking about 18 and 19?

A Okay. Page 18.

Q Okay.

A And you can see here on the top one here and it says L1 on top of page 18?

Q Yeah.

A Yeah. So look at approximately -- the very first two inches to the left, do you see all those hydrocarbons coming out? And if you look at the gasoline standard, which is on page -- please go to page 14. Now, these are not the same scale, obviously, but look at page 14. This is the gas standard.

You can see a lot of the same peaks. You can also see, what is so interesting about this L1 -- and Dr. Fisher took this sample -- it is a mixture of both weathered diesel fuel and fresh diesel fuel, weathered

gasoline and fresh gasoline. It's a mixture of all of those. That's the interesting issue.

Q And why do you say it's a mixture of all of them?

A Because of the shape of the peaks and where the peaks are. Also, if you could go to page 19 and you go to U1.

Q Okay. Go on.

A And the other interesting thing is here is -- actually, I should say page 19 on the bottom you see the standard here and here is your gasoline here, here is your diesel fuel here. Here is your sample right out of the cave. So it's clear that this material here, you have a mixture of fresh gasoline, weathered gasoline, fresh diesel, and weathered diesel.

Q Okay. So we talked earlier about the concept that there could be insulation.

A Insulation?

Q Insulation. So the concept that the center of the plume is insulated from --

A Oh.

Q -- the outer weathering impacts.

A Yeah.

Q All right. That is certainly a possibility that could exist in this situation. Would you agree

with me on that?

MR. PAGE: Object to the form.

A If the pipeline is leaking to that extent that we get an actual LNAPL, we get two layers way back in the cave, you are correct. We are not going to get much biodegradation back there. But as its flowing through the cave and the water, we are going to get anaerobic degradation, which is obviously the fastest.

Q And if there were a plume from another source that was LNAPL, you would also have insulation; correct?

A If there was a pipeline that had gasoline and diesel and was also leaking in the same cave, yes. But, again, I have no evidence that there is another pipeline on that land that has diesel and gasoline.

Q I understand. So let's stick to the plume concept. So if there is a plume -- and I don't even need to tie it to this situation.

But if there is a plume that occurs at some point in time and there is LNAPL, and let's say it's a somewhat significant plume, so not a small release that happened, there could be insulation that would insulate the hydrocarbon residues and then, as they get further away from the center of the plume, they suffer some weathering. Is that --

MR. PAGE: Objection to the form.

There's at least six different form objections on that question. Lack of foundation, calls for speculation, ambiguous.

Q (By Mr. Johnson) You can answer.

A Okay. So we have a pipeline here and say this is the source of it. And you're right, if we have enough petroleum distillates coming in one place inside the cave we're not going to get much biodegradation as it pools. But as the cave water moves, as the spring water moves we're going to get anaerobic biodegradation, yes.

Q So this is a -- well, for me -- I don't know if it is unique. But for me it's unique because we talk about the fact that there's this karst atmospheric situation and we don't know exactly which way the groundwater travels in this particular area. Is that --

MR. PAGE: Object to the form, lack of foundation.

Q (By Mr. Johnson) Do you have any understanding or any knowledge of that?

A Groundwater movement, talk to Dr. Fisher. I'm not a geologist, yeah.

Q Okay. Do you understand there is caverns and caves in this area?

A Yes, sir.

that's where we're getting the petroleum distillates. Now, as far as the exact path on how this goes, again, I don't think anybody knows.

Q And you're not -- you didn't study any drainage flows or drainage patterns or anything like that?

A No, sir, did not.

Q Okay. And so if they are in completely different drainage patterns, you wouldn't have an opinion about that, would you?

A And again, I'm not a geologist. I do not know.

MR. JOHNSON: All right. Let's take a break. And I think we've been going another hour or so. Take a quick break.

THE WITNESS: Sure.

(A break was had from 3:22 to 3:39 p.m.)

(Defendant's Exhibit 103 was marked for identification and made a part of the record.)

Q (By Mr. Johnson) Okay. Doctor, we are back on the record and I have handed you an article titled "Facts and Fallacies: Petroleum Degradation and a Subsurface Environment." And it's by Dan McNicoll, Luc Paul Tousignant and Philip Augustine. It's a 2001 article. Do you think you have seen this before?

A I may have. I don't remember.

Q Okay. It's not one that stands out?

A No.

Q All right. Recognizing you haven't seen it, I'm going to ask you a couple of questions about some of the statements in here. If you could go to page 20.

MR. PAGE: Could I just have a standing objection? No foundation with these questions --

MR. JOHNSON: Yes.

MR. PAGE: -- as a form objection. Thank you.

Q (By Mr. Johnson) Do you see the section on right that says "Age Dating"?

A Yes, sir.

Q Okay. Could you just, to yourself, read those two paragraphs, the first two paragraphs, and I will have a question for you.

(The witness reviewed the document.)

A Okay.

Q All right. So in the second paragraph these authors wrote, "Notwithstanding the obvious unreliability of co-relating weathering and age, there seems to be a widespread misconception that if petroleum with a fresh or non-weathered GC profile" -- I think that's gas chromograph -- chromo -- what does GC stand for?

A Gas chromatography.

Q Okay. Gas chromatography. Let me start again. "Not withstanding the obvious unreliability of co-relating weather and age, there seems to be a widespread misconception that if petroleum with a fresh or non-weathered GC profile is found in the subsurface it must be of recent origin." Do you agree with that statement?

A He's saying it's unreliable. I disagree with this.

Q Okay.

A I disagree with it.

Q All right. Let's go to the next page. Actually, I want to start at the bottom, sorry, of page 20. The very last sentence says, "They suggest that bioremediation is favored in this zone contact with flowing groundwater occurs (i.e. delivery of dissolved oxygen is made possible and dissolved hydrocarbons may thus be degraded). Curtis and Lammey go on to suggest that the presence of fresh free product in an old plume can be explained by an 'insulating effect' occurring around the core of the plume." Do you see with that?

A Yes, sir.

Q Okay. Do you agree that if there is a plume somewhere, there can be an insulating effect that

prevents the weathering of the hydrocarbon molecules?

A If -- and not in this case, but in a different case -- if there was a plume and it was highly concentrated, I do agree with that.

Q All right. You and I are never going to agree, it sounds like, at least this afternoon, that there is a possibility there could be a plume in this environment underneath the Tulip Springs?

A That is correct --

Q Is that right?

A -- due to the definition of what is a plume.

Q Okay. Tell me what your understanding a plume to be.

A A plume, again, when you have groundwater contamination and you have this kind of dispersion and you're making iso-concentration curves of different concentrations, and let's say it's heading north, that is a plume. In this situation we have, for lack of a better term, we have a cave.

Q Okay.

A We have --

Q So --

A We have four walls. When you think about what a cave is, four walls, that it's confined. We have contamination in a cave.

A That is correct. I apologize. That's not correct. My correction. There were two Summa canister air samples that were done inside the cave.
Q Yeah. For the water samples, though.
A Yes, sir, you are correct. But there were also two air samples.
MR. JOHNSON: Okay. All right. Let's take one final break and then I'll see if we can either be done or wrap very soon.
THE WITNESS: Okay. Great. Thank you, sir.
(A break was had from 4:06 to 4:10 p.m.)
MR. JOHNSON: We're back on the record. Thank you for your time today, Doctor. I don't have any further questions for you. Appreciate your time.
THE WITNESS: Thank you, sir.
MR. PAGE: We will read and sign.
COURT REPORTER: Mr. Page, would you like to order a copy of the deposition?
MR. JOHNSON: Yes, please.
COURT REPORTER: Is electronic okay?
MR. JOHNSON: Yes.
COURT REPORTER: Okay. Thank you.
(Deposition concluded at 4:10 p.m.)

JURAT PAGE

I, KENNETH F. EDE, Ph.D., CHMM, do hereby state under oath that I have read the above and foregoing deposition in its entirety and that the same is a full, true and correct transcript of my testimony so given at said time and place, except for the corrections noted.

_____
KENNETH F. EDE, Ph.D., CHMM

SUBSCRIBED AND SWORN TO before me, the undersigned Notary Public in and for the State of _____, by said witness, this _____ day of _____, 2022.

_____
Notary Public
My Commission Expires:_____

CORRECTION SHEET

Witness: KENNETH F. EDE, Ph.D., CHMM
Date Reported: 8/26/22
Case Style: LAZY S RANCH PROPERTIES LLC v. VALERO TERMINALING, et al.

Page	Line	Correction	Reason for Correction

CERTIFICATE

STATE OF OKLAHOMA)
) SS:
COUNTY OF OKLAHOMA)

I, Trena K. Bloye, Certified Shorthand Reporter within and for the State of Oklahoma, certify that KENNETH F. EDE, Ph.D., CHMM, was by me first duly sworn to testify the truth, the whole truth, and nothing but the truth, in the case aforesaid; that the witness chooses to read and sign the deposition; that the above and foregoing deposition was taken by me in shorthand and thereafter transcribed; that the same was taken on August 26, 2022, at 9:30 a.m., at 1437 South Boulder Avenue, Suite 170, Tulsa, Oklahoma; that I am not an attorney for, nor a relative of any of said parties or otherwise interested in the event of said action.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal this 5th day of September, 2022.

_____
Trena K. Bloye, CSR
State of Oklahoma CSR No. 1522